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LIU, LI	

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NOTIFICATION DATE	DELIVERY MODE
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

Patent-ch@btlaw.com

Office Action Summary	Application No. 10/679,824	Applicant(s) RICKARD ET AL.	
	Examiner LI LIU	Art Unit 2613	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *30 September 2009*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,3-20,22-30,32-35,37-49,51,53,55 and 57-59* is/are pending in the application.

4a) Of the above claim(s) *13-15,17-19,33, 35, 37-49,51,53,55 and 57-59* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,3-12,16,20,22-30,32 and 34* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *30 July 2008* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

1. Applicant's arguments field on 9/30/2009 have been considered but are moot in view of the new ground(s) of rejection.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 1, 3-9, 11, 12, 16, 20, 22, 23, 27, 28, 32 and 34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Smart et al (US 2002/0041637) in view of Volpi et al (US 2002/0126338) and Shpantzer et al (US 2002/0186435).

1). With regard to claims 1 and 20, Smart et al discloses an apparatus/optical transmitter (e.g., 311 in Figure 3B, and Figure 9 and 14) for generating an optical sub-carrier multiplexed signal, comprising

a digital signal processor (e.g., the IFFT 321 and P/S converter 331 in Figure 3B) having a plurality of electrical inputs, in use each receiving an input signal representing data to be carried on a sub-carrier of the optical sub-carrier multiplexed signal (Figures 2 and 3A, [0028], [0073] and [0081]-[0083] etc., the IFFT perform FFT based on the orthogonal frequency division multiplexing), and an electrical output outputting an output signal (the output from the P/S or D/A converter in Figure 3B), and

wherein the output signal of the digital signal processor is the result of a Fourier transform performed on the input signals (Figure 3B, the IFFT performs the Fourier transform),

where the spacing of the sub-carriers in the sub-carrier multiplexed signal is substantially equal to an integer multiple of 1/(Symbol period) ([0020], Smart's system is a Fourier Transform based orthogonal frequency division multiplexing OFDM, "[t]he orthogonality of the carriers means that each carrier has an integer number of cycles over a basis function period", [0020]; that is, the sub-carriers in the sub-carrier multiplexed signal is substantially equal to an integer multiple of 1/(Symbol period) since the sub-carriers are orthogonal only if they are spaced apart in frequency by an integer number of 1/T, where T is the OFDM symbol period).

But, in Figure 3B, Smart does not expressly show: a modulator having an electrical input, in use receiving the output signal from the digital signal processor, and an optical output, in use outputting the optical sub-carrier multiplexed signal; and the combined data rate of the input signals is at least 10Gb/s, and the modulator utilizes polarization multiplexing.

However, as disclosed by Smart ([0074]), the multi-channel medium 112 can be an optical fiber, an optical propagation path, etc., therefore, for the optical transmission via the optical fiber or optical propagation path, it is obvious that an optical source and modulator (or a directly modulated laser source) must be used in the system for receiving the output signal from the D/A and, and outputting the optical sub-carrier multiplexed signal, so that the SCM signals can be transmitted in the optical fiber or

optical transmission path. Another prior art, Volpi et al, discloses a system and method for optical OFDM communication, in which a digital signal processor (e.g., M-IFFFT 320 in Figure 4C) having a plurality of electrical inputs, in use each receiving an input signal representing data to be carried on a sub-carrier of the optical sub-carrier multiplexed signal (Figures 2D and 4C, [0044] and [0055] etc), and an electrical output outputting an output signal (e.g., 322 in Figure 4C), and a modulator (e.g., the modulator 324 in Figure 4C) having an electrical input, in use receiving the output signal from the digital signal processor, and an optical output (the modulator 320 drive the Laser/LED to output optical signal), in use outputting the optical sub-carrier multiplexed signal (the optical OFMD signal), wherein the output signal of the digital signal processor is the result of a Fourier transform performed on the input signals (the M-IFFT performs the Fourier transform on the input signals).

As disclosed by Smart, by the OFDM, orthogonal carriers do not interfere with each other, and thus the carriers can be closely spaced. This largely overcomes the spectral inefficiencies found in non-orthogonal FDMA systems. OFDM uses the spectrum much more efficiently by spacing the channels much closer together. With OFDM, the maximum signaling rate for the given channel (Nyquist rate) can be approached without the use of sharp cutoff filters, thereby facilitating high-speed data transmission. The OFDM system is less sensitive to interference from wide-band impulse noise than time division multiplexing (TDM) systems. Each channel in an OFDM signal has a relatively narrow bandwidth, thus the resulting symbol rate on each channel is lower than the symbol rate that could be obtained using TDMA on the same

medium. This results in the signal having a high tolerance to multipath delay spread, as the delay spread must be very long to cause significant inter-symbol interference. Also an OFDM system is spectrally much more efficient than the traditional FDMA type system where no spectral overlap is allowed ([0015]-[0021]). And Volpi et al discloses that the optical communications uses very high data bandwidths and requires very high quality of service and transmit over significant distances, and by using OFDM, the inter-symbol interference can be reduced, and a much higher level of signal quality is permitted. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine Volpi et al and Smart et al so that an optical communication system with a high quality of signal, high bandwidth and high spectral efficiency, less symbol-interference can be obtained.

As to the polarization multiplexing and the data rate of at least 10Gb/s, to combine two optical signals with orthogonal polarizations is well known in the art. Shpantzer teaches such a system (e.g., Figures 4, 5 and 11 etc); and the system and the optical to electrical converter (e.g., 700 in Figure 5 or 1150 in Figure 11) receiving a polarization diverse optical multiplexed signal. Also note that, Shpantzer teaches a modulator (e.g., Figure 4) having an electrical input (e.g., the Data Source 370) and an optical output (e.g., 342 in Figure 4) and outputting the optical multiplexed signal. And by using the polarization multiplexing, the system capacity can be increased. And it is also well known in the art that the optical fiber has higher bandwidth than twisted pair cable or coaxial cable etc; and Shpantzer's system is used "to improve the spectral efficiency of existing/planned DWDM standards (OC-48 at 2.048 Gbps or OC-192 at 10

Gbps) using existing fiber optic cables. There also remains a need for PMD compensation of the received optical signal" ([0010]), and the channel bandwidth can be 100 GHz ([0053]). That is, Shpantzer teaches that the combined data rate of the input signals is at least 10Gb/s.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to apply a polarization multiplexing scheme and high channel bandwidth as taught by Shpantzer et al to the system of Smart et al and Volpi et al so that the modulator can generate a polarization diverse optical sub-carrier multiplexed signal (or two optical sub-carrier signal with orthogonal polarizations) and then system capacity can be increased, the system bandwidth can be efficiently utilized, and signals with data rate of 10 Gbit/s and higher can be transmitted with high quality.

2). With regard to claim 3, Smart et al and Volpi et al and Shpantzer et al disclose all of the subject matter as applied to claim 1 above. And Smart et al further discloses a mapper (e.g., 320 in Figure 3B or 1403 in Figure 14, the modulator 320 assigns data bits (symbols) to each of the carriers and modulates the carriers, that is, modulator 320 is a mapper, [0082] and [0174]) having an electrical input (DATA IN of Figure 3B), in use receiving binary data, and a plurality of electrical outputs (Figure 3B, the plurality of electrical outputs from 320) connected to the electrical inputs of the digital signal processor (Figure 3B, IFFT), wherein the signals carried by the outputs are a representation of the binary data according to a predetermined modulation format (e.g., the QPSK, QAM etc, Figure 3B).

3). With regard to claim 4, Smart et al and Volpi et al and Shpantzer et al disclose all of the subject matter as applied to claims 1 and 3 above. And the combination of Smart et al and Volpi et al and Shpantzer et al further discloses where the predetermined modulation format is a phase modulation format (e.g., Smart: [0022] and [0083]; or Shpantzer: [0063]-[0065]).

4). With regard to claim 5, Smart et al and Volpi et al and Shpantzer et al disclose all of the subject matter as applied to claims 1 and 3 above. And the combination of Smart et al and Volpi et al and Shpantzer et al further discloses where the predetermined modulation format is a differential phase modulation format (e.g., Smart: [0022] and [0083], and claim 20; or Shpantzer: [0017]).

5). With regard to claim 6, Smart et al and Volpi et al and Shpantzer et al disclose all of the subject matter as applied to claims 1 and 3 above. And the combination of Smart et al and Volpi et al and Shpantzer et al further discloses where the predetermined modulation format is an amplitude modulation format e.g., Smart: [0022] and [0083]; or Shpantzer: [0063]-[0065]).

6). With regard to claim 7, Smart et al and Volpi et al and Shpantzer et al disclose all of the subject matter as applied to claims 1 and 3 above. And the combination of Smart et al and Volpi et al and Shpantzer et al further disclose where the predeteremined modulation format is an amplitude and phase modulation format (Shpantzer: [0063]).

7). With regard to claim 8, Smart et al and Volpi et al and Shpantzer et al disclose all of the subject matter as applied to claim 1 above. And Smart et al further

discloses the digital signal processor further comprising a serialiser (e.g., P/S 331 in Figure 3B), having a plurality of electrical inputs connected to the electrical outputs of the digital signal processor, and an electrical output in use carrying a signal generated by the serialisation of the signals carried on the plurality of electrical inputs to the serialiser.

8). With regard to claim 9, Smart et al and Volpi et al and Shpantzer et al disclose all of the subject matter as applied to claim 1 above. And Smart et al further discloses a digital to analogue converter (the D/A in Figure 3B) having an electrical input connected to the electrical output of the digital signal processor, and an electrical output connected to the modulator (e.g., for optical transmission, an optical source and modulator (or a directly modulated laser source) must be used in the system of Smart. Or Volpi et al: Figure 4C, the modulator 424 receives electrical output), in use the output of the digital to analogue converter being an analogue representation of the digital input signal.

9). With regard to claims 11 and 12, Smart et al and Volpi et al and Shpantzer et al disclose all of the subject matter as applied to claim 1 above. And Smart et al and Volpi et al and Shpantzer et al further disclose wherein the modulator is configured to modulate the amplitude and phase of an optical carrier (Shpantzer: [0063]); and wherein the modulator comprises two Mach-Zehnder structures (Shpantzer: e.g., 830a and 830b, or 830c and 830d, Figure 4, [0063]), connected to an optical combiner (e.g., Figure 4, 840a or 840b).

10). With regard to claim 16, Smart et al and Volpi et al and Shpantzer et al disclose all of the subject matter as applied to claim 1 above. And the combination of Smart et al and Volpi et al and Shpantzer et al further discloses a forward error correction coder (e.g., Smart: the FEC 1402 and 1412 in Figure 14; or Volpi: the FEC in Figures 4C and 4D) connected to the digital signal processor, in use applying forward error correction coding to the data.

11). With regard to claims 22 and 34, Smart et al discloses an apparatus/receiver for receiving an optical sub-carrier multiplexed signal (e.g., 313 in Figure 3B, and Figure 9), the apparatus comprising

an A/D converter (323 in Figure 3B), in use receiving the sub-carrier multiplexed signal and outputting an electrical signal, and

a digital signal processor (e.g., the P/S 332 and IFFT 324 etc in Figure 3B) having an electrical input, in use receiving the output of the A/D converter, and a plurality of electrical outputs, in use each carrying a signal representing data carried on a sub-carrier of the optical sub-carrier multiplexed signal ([0028], [0073] and [0081]-[0088] etc., the IFFT perform FFT based on the orthogonal frequency division multiplexing),

wherein, the outputs of the digital signal processor are the result of a Fourier transform performed on the input signal (the IFFT 324 performs the Fourier transform on the input signal),

where the spacing of the sub-carriers in the sub-carrier multiplexed signal is substantially equal to an integer multiple of 1/(Symbol period) ([0020], Smart's system is

a Fourier Transform based orthogonal frequency division multiplexing OFDM, "[t]he orthogonality of the carriers means that each carrier has an integer number of cycles over a basis function period", [0020]; that is, the sub-carriers in the sub-carrier multiplexed signal is substantially equal to an integer multiple of 1/(Symbol period) since the sub-carriers are orthogonal only if they are spaced apart in frequency by an integer number of 1/T, where T is the OFDM symbol period).

But, in Figure 3B, Smart et al does not expressly show the apparatus for receiving a polarization diverse optical sub-carrier multiplexed signal, and an optical to electrical converter, in use receiving a polarization diverse optical sub-carrier multiplexed signal, and the combined data rate of the signals carried by the plurality of electrical outputs is at least 10 Gb/s.

However, as disclosed by Smart, [0074], the multi-channel medium 112 can be an optical fiber, an optical propagation path, etc., therefore, for the optical transmission via the optical fiber or optical propagation path, it is either obvious to one skilled in the art or inherent that an optical to electrical converter must be used in the system to convert the optical signal to electrical signal and then to the A/D converter 323, and outputting the electrical signal, so that the optical communication can be utilized, and the SCM signals can be received via the optical fiber or optical transmission path. Another prior art, Volpi et al, discloses a system and method for optical OFDM communication, in which an optical to electrical converter (photodiode in receiver 360 of Figure 5A), in use receiving the optical sub-carrier multiplexed signal and outputting an electrical signal, and a digital signal processor (M-FFT 368 in Figure 5A) having an

electrical input, in use receiving the output of the optical to electrical converter, and a plurality of electrical outputs, in use each carrying a signal representing data carried on a sub-carrier of the optical sub-carrier multiplexed signal (the optical FDMA signals), wherein, the outputs of the digital signal processor are the result of a Fourier transform performed on the input signal (the M-FFT performs the Fourier transform).

As disclosed by Smart, by the OFDM, orthogonal carriers do not interfere with each other, and thus the carriers can be closely spaced. This largely overcomes the spectral inefficiencies found in non-orthogonal FDMA systems. OFDM uses the spectrum much more efficiently by spacing the channels much closer together. With OFDM, the maximum signaling rate for the given channel (Nyquist rate) can be approached without the use of sharp cutoff filters, thereby facilitating high-speed data transmission. The OFDM system is less sensitive to interference from wide-band impulse noise than time division multiplexing (TDM) systems. Each channel in an OFDM signal has a relatively narrow bandwidth, thus the resulting symbol rate on each channel is lower than the symbol rate that could be obtained using TDMA on the same medium. This results in the signal having a high tolerance to multipath delay spread, as the delay spread must be very long to cause significant inter-symbol interference. Also an OFDM system is spectrally much more efficient than the traditional FDMA type system where no spectral overlap is allowed ([0015]-[0021]). And Volpi et al discloses that the optical communications uses very high data bandwidths and requires very high quality of service and transmit over significant distances, and by using OFDM, the inter-symbol interference can be reduced, and a much higher level of signal quality is

permitted. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine Volpi et al and Smart et al so that an optical communication system with a high quality of signal, high bandwidth and high spectral efficiency, less symbol-interference can be obtained.

As to the polarization multiplexing and the data rate of at least 10Gb/s, to combine two optical signals with orthogonal polarizations is well known in the art. Shpantzer teaches such a system (e.g., Figures 4, 5 and 11 etc); and the system has the optical to electrical converter (e.g., 700 in Figure 5 or 1150 in Figure 11) receiving a polarization diverse optical multiplexed signal. And by using the polarization multiplexing, the system capacity can be increased. And it is also well known in the art that the optical fiber has higher bandwidth than twisted pair cable or coaxial cable etc; and Shpantzer's system is used "to improve the spectral efficiency of existing/planned DWDM standards (OC-48 at 2.048 Gbps or OC-192 at 10 Gbps) using existing fiber optic cables. There also remains a need for PMD compensation of the received optical signal" ([0010]), and the channel bandwidth can be 100 GHz ([0053]). That is, Shpantzer teaches that the combined data rate of the input signals is at least 10Gb/s.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to apply a polarization multiplexing scheme and high channel bandwidth as taught by Shpantzer et al to the system of Smart et al and Volpi et al so that the optical to electrical converter receives a polarization diverse optical sub-carrier multiplexed signal (or two optical sub-carrier signal with orthogonal polarizations) and then system capacity can be increased, the system bandwidth can be efficiently

utilized, and signals with data rate of 10 Gbit/s and higher can be transmitted with high quality.

12). With regard to claim 23, Smart et al and Volpi et al and Shpantzer et al all of the subject matter as applied to claim 22 above. And the combination of Smart et al and Volpi et al and Shpantzer et al further discloses a decoder (e.g., Figure 3B, the De-Modulator 325; or Volpi: DEMUX 372 in Figure 5A) having a plurality of electrical inputs in use receiving the outputs of the digital signal processor, and an electrical output (Figure 3B, the De-Modulator 325 receives the outputs of the IFFT and outputs an electrical signal DATA OUT), in use outputting binary data (the DATA OUT. Also, Figure 15 shows the decoders 1512 and 1522).

13). With regard to claim 27, Smart et al and Volpi et al and Shpantzer et al disclose all of the subject matter as applied to claim 22 above. And Smart et al further discloses the digital signal processor comprising

a de-serialiser (Figure 3B, P/S 332) having an electrical input receiving the output of the optical to electrical converter and outputting a plurality of signals obtained by the deserialisation of the input,

a Fourier transform unit (e.g., the IFFT in Figure 3B) having a plurality of electrical inputs, in use receiving the outputs of the de-serialiser, and a plurality of electrical outputs (Figure 3B), in use each carrying a signal representing data carried on a sub-carrier of the optical sub-carrier multiplexed signal ([0028], [0073] and [0081]-[0088] etc., the IFFT perform FFT based on the orthogonal frequency division multiplexing),

wherein the electrical outputs of the Fourier transform unit are the result of a Fourier transform performed on the inputs (the IFFT performs the Fourier transform on the inputs).

14). With regard to claim 28, Smart et al and Volpi et al and Shpantzer et al disclose all of the subject matter as applied to claim 22 above. And the combination of Smart et al and Volpi et al and Shpantzer et al further discloses a forward error correction decoder connected to the digital signal processor, in use performing error correction on the data (Smart: [0082], the demodulator 325 demodulates the carriers to extract the output data; and “other conventional operations, such as framing, blocking, and error correction can also be provided”; or Volpi: EDAC in Figure 5).

15). With regard to claim 32, Smart et al and Volpi et al and Shpantzer et al disclose discloses all of the subject matter as applied to claim 22 above. And the combination of Smart et al and Volpi et al and Shpantzer et al further discloses the apparatus comprising an optical demultiplexer (Shpantzer: e.g., the Demux 230 in Figure 2a, and 1102 in Figure 11) having an optical input in use receiving the plurality of optical sub-carrier multiplexed signals (Shpantzer: Figures 2 and 11), and a plurality of optical outputs (the outputs from the Demultiplexer in Figure 2 and 11) in use each output carrying at least one of the optical sub-carrier multiplexed signals, wherein the outputs are connected to the receivers (Shpantzer: e.g., 1110 in Figure 11).

4. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Smart et al and Volpi et al and Shpantzer et al as applied to claim 1 above, and in further view of Sandell et al (US 2004/0131011) and Fee (US 2004/0223759).

Smart et al discloses all of the subject matter as applied to claim 1 above. But, Smart does not expressly an electrical signal generator, connected to an input of the modulator, wherein a small depth modulation is imparted on the optical sub-carrier multiplexed output signal.

However, to insert a reference signal or pilot signal to the SCM signal is well known in the art. Sandell et al teaches an electrical signal generator to generate a pilot signal for determining a channel estimate (amplitude change and phase shift etc.) ([0008], [0026] and [0030]). But, Sandell et al does not expressly state wherein a small depth modulation is imparted on the optical sub-carrier multiplexed output signal.

Fee, in the same field of endeavor, teaches a monitoring signal with a small depth modulation imparted on the optical carrier output signal (Figures 6-9). By monitor the modulation tone or the superimposed signal, the signal transmission quality can be deduced and monitored.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to apply the reference signal as taught by Sandell et al and Fee to the system of Smart et al and Volpi et al and Shpantzer et al so that the channel estimation can be readily determined.

5. Claims 24, 25, 29 and 30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Smart et al and Volpi et al and Shpantzer et al as applied to claims 22, 23 and 28 above, and in view of Maltsev et al (US 7,286,609).

1). With regard to claims 24 and 25, Smart et al and Volpi et al and Shpantzer et al disclose all of the subject matter as applied to claims 22 and 23 above. But, Smart et

al and Volpi et al and Shpantzer et al do not expressly state that the decoder comprising a serialiser having a plurality of inputs receiving the outputs of the digital signal processor, and an output outputting a signal derived by the serialisation of the input signals; and wherein the output data is determined by the comparison of the input signals with a predetermined value.

However, Maltsev et al, in same field of endeavor, teaches a SCM transmission system and method that comprises a decoder (e.g., Decoder 230 and P/S 232 in Figure 2) having a plurality of electrical inputs in use receiving the outputs of the digital signal processor and an electrical output (the output 234 in Figure 2), in use outputting binary data (the output 234 in Figure 2); and the decoder comprising a serialiser (e.g., the P/S transform block 232 in Figure 2) having a plurality of inputs receiving the outputs of the digital signal processor, and an output outputting a signal (the signal 234 in Figure 2) derived by the serialisation of the input signals; and the output data is determined by the comparison of the input signals with a predetermined value (column 5, line 48-53, column 7, line 31-32, column 8 line 22-42, column 11 line 8, and column 13 line 52-54).

Maltsev et al provides high throughput and reduced interference and less expensive system. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to apply the receiver structure as taught by Maltsev et al to the system of Smart et al and Volpi et al and Shpantzer et al so that a high quality and less expensive receiver can be utilized.

2). With regard to claims 29 and 30, Smart Smart et al and Volpi et al and Shpantzer et al disclose all of the subject matter as applied to claims 22 and 28 above.

But, Smart et al and Volpi et al and Shpantzer et al do not expressly disclose the apparatus further comprising apparatus to determine channel state information of the sub-carriers; and wherein the channel state information is utilised by the forward error correction decoder to improve the performance of the error correction.

However, Maltsev et al teaches an apparatus that determines channel state information of the sub-carriers (Figure 2, the channel state information 236 is provided to the SMA 202); and the channel state information is utilised by the forward error correction decoder to improve the performance of the error correction (column 5, line 15-49, and column 2, line 1-24, the SMA controls the decoding of individual ones of the received subcarrier based on the CSI etc.)

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to apply the channel state information as taught by Maltsev et al to the system of Smart et al and Volpi et al and Shpantzer et al so that the decoder can efficiently and accurately decode the signals based on the channel state information etc.

6. Claim 26 is rejected under 35 U.S.C. 103(a) as being unpatentable over Smart et al and Volpi et al and Shpantzer et al as applied to claims 22 and 23 above, and in further view of Sandell et al (US 2004/0131011).

Smart et al and Volpi et al and Shpantzer et al disclose all of the subject matter as applied to claims 22 and 23 above. But, Smart et al and Volpi et al and Shpantzer et al do not expressly disclose wherein the decoder comprises a maximum likelihood sequence estimation decoder.

However, as disclosed by Sandell the maximum likelihood sequence estimation (MLSE) is the conventional channel estimation technique ([0019]), in which a most probable received sequence is chosen from a set of all possible received sequences. MLSE decoding can incorporate detailed knowledge of the statistical properties of noise and crosstalk and other channels parameters into the decision process, therefore improving performance in the presence of these impairments.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to apply the MLSE technique as widely used in the art to the system of Smart et al and Volpi et al and Shpantzer et al so that the decoder can efficiently and accurately decode the signals in the present interferences.

Conclusion

7. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Jones, IV (US 6,611,551).

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to LI LIU whose telephone number is (571)270-1084. The examiner can normally be reached on Monday-Friday, 8:30 am - 6:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ken Vanderpuye can be reached on (571)272-3078. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Li Liu/
Examiner, Art Unit 2613
January 1, 2010